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# Certificate

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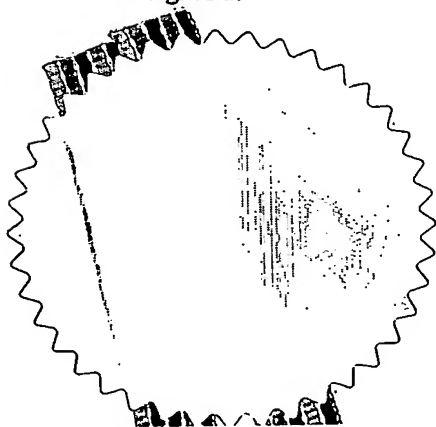
the documents annexed hereto are true copies of:


Application forms P.1, P2 and provisional specification and drawings of South African Patent Application No. 2003/7940 as originally filed in the Republic of South Africa on 13 October 2003 in the name of DETNET SOUTH AFRICA (PTY) LTD for invention entitled: " DETONATOR ASSEMBLY."

Geteken te  
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PATENTS ACT, 1978

## REGISTRAR OF PATENTS

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Full name(s) of applicant(s)/Patentee(s)					
71	DETNET SOLUTIONS (PTY) LTD				
Applicant(s) substituted:					
71	DETNET SOUTH AFRICA (PTY) LTD			Date Registered:	
				01.07.04	
Assignee(s):					
71				Date Registered:	
Full name(s) of inventor(s)					
72	WHITE, Michael, David, Edwards				
Priority claimed					
Note:		Country	Number	Date	
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Abbreviation for Country		33		31	
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54	DETONATOR ASSEMBLY				
Address of applicant(s)/patentee(s)					
Parklands Place, Pinelands, 1645					
Address for Service:					
74	McCALLUM, RADEMEYER & FREIMOND, Maclyn House, 7 June Avenue, Bordeaux, Randburg • P.O. Box 1130, Randburg 2125				
Patent of Addition to Patent No.:		Date of any change:			
61					
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McCALLUM, RADEMEYER & FREIMOND  
Ref. P20070

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APPLICATION FOR A PATENT AND ACKNOWLEDGEMENT OF RECEIPT

(Section 30(1) - Regulation 22)

The grant of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

OFFICIAL APPLICATION NO.

21 01 2003/7940

REGISTRAR OF PATENTS DESIGNS,

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Machine Impression

2003 -10- 16

REGISTRATEUR VAN PATENTE, MODELLE  
HANDELSMERKE EN OUTEURSREG

FULL NAME(S) OF APPLICANT(S)

71

DETNET SOLUTIONS (PTY) LTD

ADDRESS(ES) OF APPLICANT(S)

Parklands Place, Pinelands, 1645

TITLE OF INVENTION

54

DETONATOR ASSEMBLY

Priority is claimed as set out on the accompanying Form P2.

The earliest priority claimed is: NONE

This application is a patent of addition to Patent Application No.

21

01

This application is a fresh application in terms of section 37 and based on Application No.

21

01

THIS APPLICATION IS ACCOMPANIED BY:

- ☒ 1 A single copy of a provisional specification of ...13... pages
- ☐ 2 Two copies of a complete specification of ..... pages
- ☒ 3 ...6 ... Sheets of Informal Drawings
- ☐ 4 ..... Sheets of Formal Drawings
- ☐ 5 Publication particulars and abstract (Form P8 in duplicate)
- ☐ 6 A copy of Figure ..... of drawings (if any) for the abstract
- ☐ 7 Assignment of Invention
- ☐ 8 Certified priority document(s) Number(s)
- ☐ 9 Translation of priority document(s)
- ☐ 10 An assignment of priority rights
- ☐ 11 A copy of the Form P2 and the specification of SA Patent Application
- ☐ 12 A declaration and power of attorney on Form P3
- ☐ 13 Request for ante-dating on Form P4
- ☐ 14 Request for classification on Form P9
- ☒ 15 Form P2 in duplicate

21

01

74 ADDRESS FOR SERVICE: McCALLUM, RADEMEYER & FREIMOND, Maclyn House, June Avenue, Bordeaux  
P.O. Box 1130, Randburg, 2125

Dated 13 October 2003

McCALLUM, RADEMEYER & FREIMOND  
PATENT AGENTS FOR APPLICANT(S)

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2003-10-13

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**PROVISIONAL SPECIFICATION**

(Section 30(1) – Regulation 27)

OFFICIAL APPLICATION NO

21.	01.	2003 / 7940
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LODGING DATE

22	13 October 2003
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FULL NAME(S) OF APPLICANT(S)

71	DETNET SOLUTIONS (PTY) LTD
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FULL NAME(S) OF INVENTOR(S)

72	WHITE, Michael, David, Edwards
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TITLE OF INVENTION

54	DETONATOR ASSEMBLY
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# BACKGROUND OF THE INVENTION

[0001] This invention relates generally to a detonator assembly and is also concerned with a method of installing a plurality of detonators in a plurality of respective boreholes.

5 [0002] It is known to make use of electronic detonators, which are individually programmable, to establish a blasting configuration. Each detonator is assigned a unique identity number and is connected in parallel to a trunk cable. As each detonator is uniquely identified it is possible to address a chosen detonator and program desired blasting information into the  
10 detonator.

[0003] In a different connection technique a plurality of detonators are connected to one another in a daisy-chain configuration. In this arrangement the detonators are addressed in sequence with a given detonator being placed in a programming mode while the other detonators are in a non-programmable mode. Certain benefits are associated with a daisy-chain  
15 arrangement although one disadvantage arises from the need to make a connection between each detonator in the sequence and the following and preceding detonators. This aspect, together with the requirement of being able to insert a detonator to a variable depth inside a borehole, gives rise to a requirement that two variable lengths of cable must be associated with each  
20 detonator ie. a first cable length to go down a first borehole and a second cable length to go from the first borehole to an adjacent, second borehole. In

dealing with the cables associated with each of a large number of detonators, the cables can become entangled with one another and errors can arise in configuring a blasting sequence.

5 [0004] Another aspect which should be addressed is that each detonator should be packaged in a way which facilitates the use of automated manufacturing and testing processes, which readily allows for handling and transport, and which enables each detonator to be labelled so that it complies with applicable regulations and legislation.

#### SUMMARY OF INVENTION

10 [0005] The invention provides a detonator assembly which includes a housing, a first cable coil, with first and second ends, at least partly inside the housing, a second cable coil, with third and fourth ends, at least partly inside the housing, a detonator connected to the first end of the first coil, a first connector connected to the second end of the first coil and the third end of the  
15 second coil, and a second connector connected to the fourth end of the second coil and wherein a first variable length of cable, extending from the first end, can be withdrawn from the housing without materially moving the first connector and a second variable length of cable, extending from the fourth end, can be withdrawn from the housing without materially moving the  
20 first connector.

[0006] The first cable coil may be provided in the form of a first tubular roll with the first end inside the tubular roll. Similarly the second cable coil may be

provided in the form of a second tubular roll with the fourth end inside the tubular roll.

**[0007]** The first connector may be accessible without opening the housing. The first connector may for example be positioned inside a recess formed in an outer surface of the housing.

**[0008]** The second and third ends of the cables, which are connected to the first connector, are preferably integrally connected and at no time are separable from each other. These ends may extend out of the housing into the recess.

**[0009]** The housing may include a first compartment for the first coil. A second compartment may be provided inside the housing for the second coil. At least one divider may be positioned between the compartments. Preferably the first and second coils are separated by at least two dividers. Each divider may be provided in any appropriate way and preferably each divider abuts at least one recessed formation which extends from an outer surface of the housing into an interior of the housing.

**[0010]** The housing may be six sided and generally may be in the form of a parallelepiped. The housing may have four relative large sides and two relatively small sides which form opposed ends of the housing.

[0011] The housing may be made from any suitable material and preferably is made from cardboard which may be corrugated or a similar bio-degradable material.

.5 [0012] The first and third ends of the cables may extend through respective apertures in the smaller sides of the housing.

10 [0013] The invention also provides a method of forming a cable coil assembly for use in the aforementioned detonator assembly which includes the steps of drawing cable from a supply source and winding a single coil of a first predetermined length around a first former, severing the cable so that the single coil is separated at a first end from the supply source, and forming a first cable coil by winding cable, of a second predetermined length which is shorter than the first length, drawn from the single coil, commencing at the first end, around a second former, and thereby simultaneously forming a second cable coil of a length which is substantially equal to the difference  
15 between the first and second lengths.

[0014] The single coil may be formed by winding the cable in a first direction around the first former and the first coil may be formed by winding cable drawn from the single coil in a second direction around the second former, wherein the first direction is opposite to the second direction.

20 [0015] The invention also provides a method of installing a plurality of detonators in a respective plurality of boreholes in a daisy-chain configuration which includes the steps, for each borehole, of drawing a first length of cable



from a first cable coil, from a housing, positioning a first detonator which is connected to a first end of the first length of cable at a predetermined depth inside the respective borehole, drawing a second length of cable from a second cable coil inside the housing and connecting a first connector which is at a junction of the first and second coils, at the housing, to a second connector which is at an end of a respective second length of cable associated with a first borehole.

[0016] The invention also includes the step of connecting a respective second connector at an end of the second length of cable, associated with the respective borehole, to a respective first connector at a second borehole.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The invention is further described by way of example with reference to the accompanying drawings in which:

Figure 1 schematically depicts a plurality of detonators which are located in respective boreholes and which are connected to each other in a daisy-chain configuration;

Figure 2 is a cross sectional view of a detonator assembly according to the invention;

Figures 3 and 4 are perspective views of the detonator assembly of Figure 2 illustrating different aspects thereof;

Figure 5 is a schematic side view of a detonator assembly according to the invention with a housing thereof fully opened;

Figures 6 to 8 show the detonator assembly in different stages of manufacture; and

Figures 9, 10 and 11 illustrate steps in the winding of cable coils for use in the detonator assembly of the invention.

## 5      DESCRIPTION OF PREFERRED EMBODIMENT

10      **[0018]** Figure 1 of the accompanying drawings illustrates somewhat schematically a plurality of boreholes 10A, 10B ... 10N which are drilled in the ground 12 using conventional techniques. A respective detonator 14A, 14B ... 14N is placed in each borehole. A first length 16A, 16B ... 16N of cable extends from the respective detonator to a respective first connector 18A, 18B ... 18N which is positioned at surface, and a respective second length 20A, 20B .... 20N of cable extends between adjacent pairs of connectors 18A and 18B, 18B and 18C, ... 18N - 1 and 18N.

15      **[0019]** As indicated in the preamble to this specification practical problems arise, when making a daisy-chain arrangement of the type shown in Figure 1, in that the lengths 16 and 20 of the cables are variable. If standard lengths of cable are connected, beforehand, to a connector 18 then once a detonator 14 is placed in a borehole a first excess portion of cable can lie at the mouth of the borehole while, once a connection is made between a connector 18A and  
20      a following connector 18B, a second excess length of cable can lie on the surface between the boreholes. The invention is aimed at addressing at least this type of problem.

5 [0020] Figure 2 illustrates a detonator assembly 30 according to the invention. The assembly includes a housing 32 which is of parallelepiped form which, as is more clearly shown in Figures 3 and 4, has four relatively large rectangular sides and opposed ends 34 and 36 which are smaller than the larger rectangular sides. The housing 32 is made from a corrugated cardboard blank 38 generally of the type shown in Figure 5 which is formed with lines of weakness and cut-outs so that the blank can be folded into the configuration shown in Figures 3 and 4. At three of its longitudinal corners 40A, 40B and 40C respectively, portions of the blank can be forced inwardly to form right angled recess formations 42A, 42B and 42C respectively. As is shown in Figure 2 end portions 44 and 46 of the blank abut these formations, on an inner side of the housing, and thereby divide the housing interior into three compartments 50, 52 and 54 respectively.

15 [0021] Figure 4 illustrates further details of the recessed formation 42C which extends a substantial portion of the width of the respective side, designated 56. A relatively large rectangular window 58 is formed in a base of the recessed formation. A rectangular cardboard insert 60, which has a centrally located relatively small rectangular window 62, is locatable in the recessed formation 42C.

20 [0022] Figures 9 to 11 illustrate successive stages in the manufacture of two coils of cable from a single length of cable 66. A large drum 68 of the cable 66 is mounted to suitable support structure 70. The cable 66 is passed over suitable pulleys and rollers 72 and 74 respectively and is wound in a first

direction 76 about a first former 78. A predetermined length of cable, say 40 metres long, is wound onto the former 78 to form a single coil 80. A first end 82 of the cable extends from an interior of the coil. Thereafter the coil is severed by means of a set of knives 84. The cable is then wound onto a second former 86 in a direction 88 which is opposite to the first direction 76. The cable is drawn from the single coil 80 for this purpose. In this way, as is shown in Figure 11, a first coil 90 is formed with a predetermined length of cable of, say, 30 metres and a second coil 92 is formed with a predetermined length of, say, 10 metres. The first coil has a second end 94 which is integrally connected to an end 96 of the second coil (referred to herein as the third end). A free end of the coil 92 designated 98, and referred to herein as the fourth end, extends from an interior of the second coil.

**[0023]** As is shown in Figure 2 the first and second coils are inserted into the compartments 50 and 54 respectively. The end portions 44 and 46, which act as dividers, have slits 99 which enable the cable section 100 between the coils (effectively the integrally joined ends 94 and 96 shown in Figure 11) to pass through the slits. This cable section 100 is then looped through the window 58, as is shown in Figures 5 and 6. The first end 82 of the first coil is passed through an aperture 104 in the end 34 of the housing while the fourth end 98 of the second coil is passed through an aperture 106 in the end 36.

**[0024]** Referring particularly to Figures 7 and 8 a first connector 110 is crimped onto the cable section 100 without severing this cable ie. the first and second coils are at all times integrally connected to each other. A label 112 is

attached to the cable adjacent the first connector. A second connector 114 is attached to the fourth end of the cable. A detonator 116 of conventional design which is suited for daisy-chain connections is attached to the first end 82 of the cable.

5       **[0025]** The end 82 is looped, as is shown in Figures 2 and 8, and the detonator 116 is inserted into the compartment 50 so that it lies inside the hollow interior of the first coil 90. The fourth end 98 is folded over an external surface of the housing and is coupled with a press fit to the first connector 110. The cardboard insert 60 is then manipulated so that the connectors 110  
10       and 114 pass through the window 62 together with the label 112. The insert is then pushed into the recessed formation 42C (sée Figure 4) so that the connectors are contained within the recessed formation. Thereafter a preformed tubular sleeve 120, of rectangular cross-section, is placed over the housing to envelope the four larger sides. The sleeve is pre-printed with  
15       information which relates to the detonator and which is prescribed by regulation and legislation. The sleeve has slits 122 which define a rectangular section 124 which can be folded inwardly to nestle in the recessed formation 42B so that the sleeve is thereby kept in position on the housing.

20       **[0026]** When the detonator assembly is to be used it is transported to a blast site and allocated to a particular borehole 10. A tab 136 on the sleeve is pulled to tear the sleeve free from the housing or, alternatively, the sleeve is torn only enough to expose the connector set. The connectors 110 and 114 are then detached from each other. The detonator 116 is extricated from the

interior of the housing. Cable is drawn from the first coil 90 so that the detonator can be inserted to a predetermined depth inside the borehole. It is pointed out in this respect that the detonator 116 shown in Figure 7 corresponds to a detonator 14 shown in Figure 1. The length of cable between the detonator and the housing 32 is designated by the reference numeral 16 in Figure 1. A predetermined length of cable, corresponding to the length 20 shown in Figure 1, is drawn from the second coil. This enables the connector 114 to be connected to a corresponding first connector 110 at an adjacent borehole 14B, as is shown in Figure 1.

**[0027]** As each length of cable 16 and 20 is drawn from the housing the position of the first connector 110 is not materially altered. Excess cable not required for making connections between adjacent boreholes is left in the housing.

**[0028]** By mounting two coils inside the housing multiphase manufacturing steps are made possible. The housing, with its contents, can be moved or indexed through sequential automated manufacturing processes. The detonator and the connectors can be tested while secured within the packaging.

**[0029]** The outer sleeve is preferably pre-printed with deployment instructions and safety information as may be stipulated by local and international legislation. The sleeve is kept in position, relatively to the housing, by means of the folded portion 124 which engages with a corresponding recess 42B.

[0030] The recessed formations 42A and 42B facilitate handling of the housing for they provide convenient handgrips.

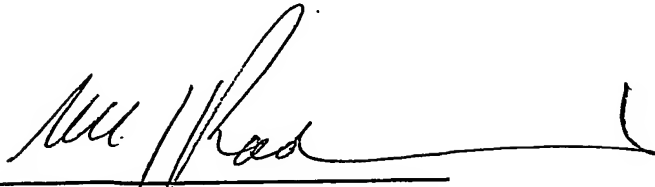
5 [0031] The detonator 116 is preferably stored as is shown in Figure 2, within the confines of the first coil 90. This, together with the partitioned packaging design, provides a substantial amount of separation of detonators which are in a plurality of detonator assemblies. The detonator can be removed from the housing without undue handling of the housing.

10 [0032] The rectangular or parallelepiped shape of the housing helps to limit rolling of the housing on uneven rock surfaces of the kind encountered at a typical blast site.

15 [0033] The detonator assembly provides a means of connection between detonators within the same or sequential blast holes by permitting sufficient cable to be withdrawn from the housing. Unused cable remains securely within the packaging and the likelihood of cable knots or damage occurring is reduced.

[0034] The invention has been described with reference to the use of a single detonator in each borehole. Similar techniques can be employed to make connections between two or more detonators in a single borehole, if required.

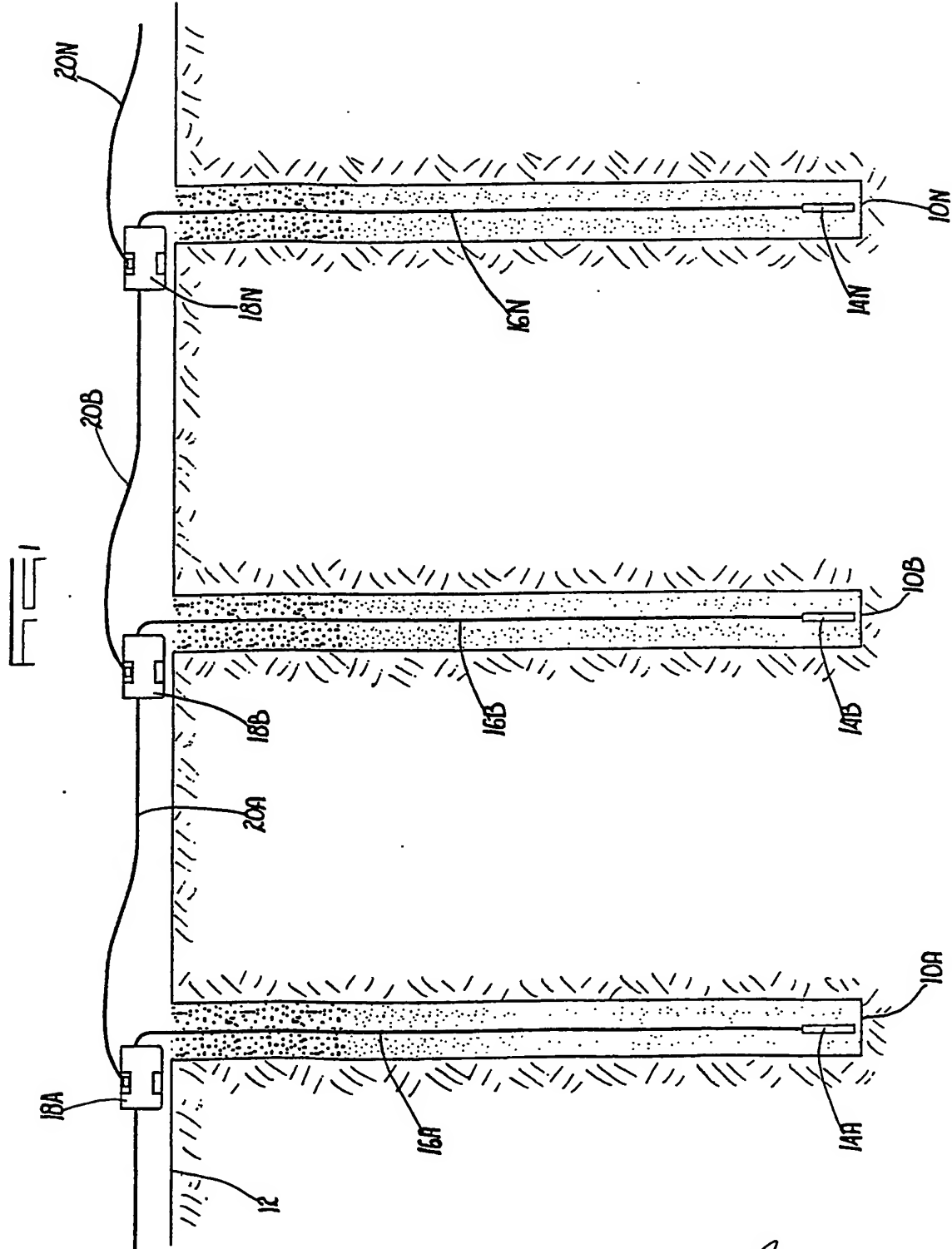
Dated this 13<sup>th</sup> day of October 2003.



McCALLUM, RADEMEYER & FREIMOND  
Patent Agents for the Applicant

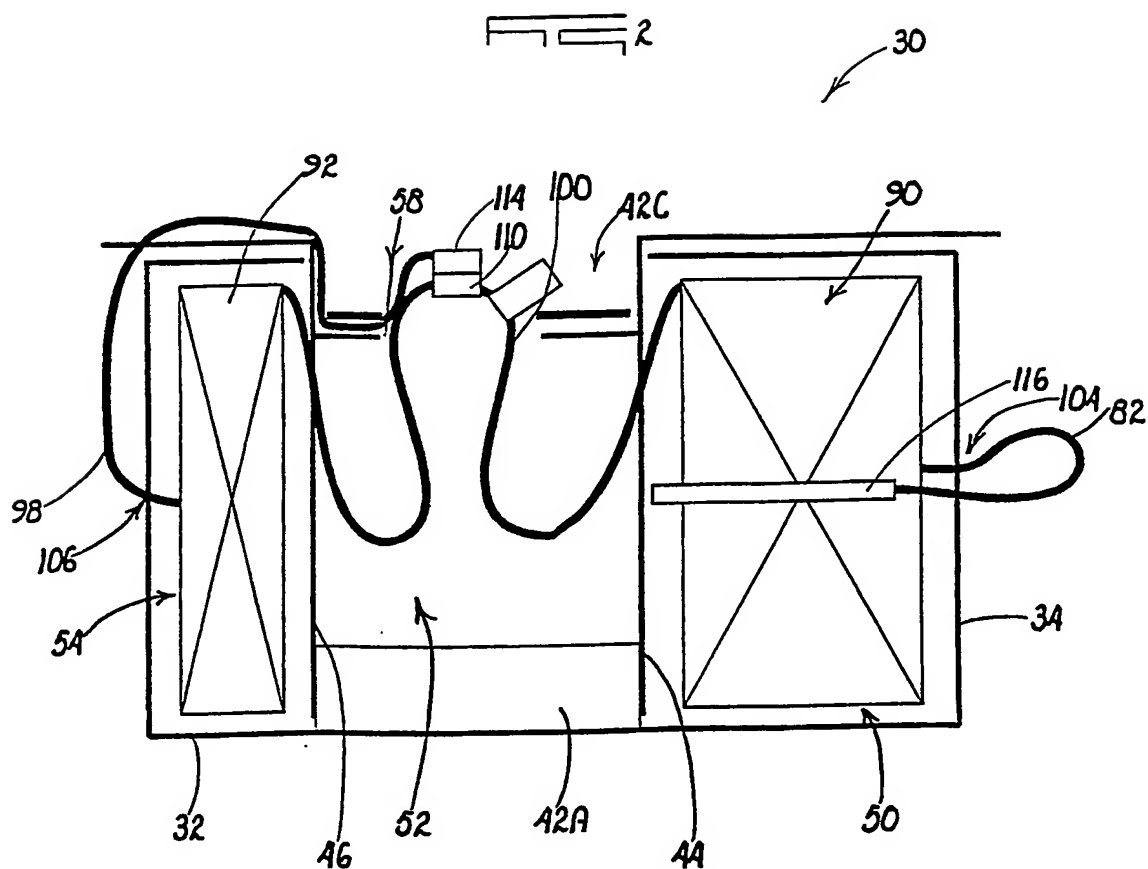
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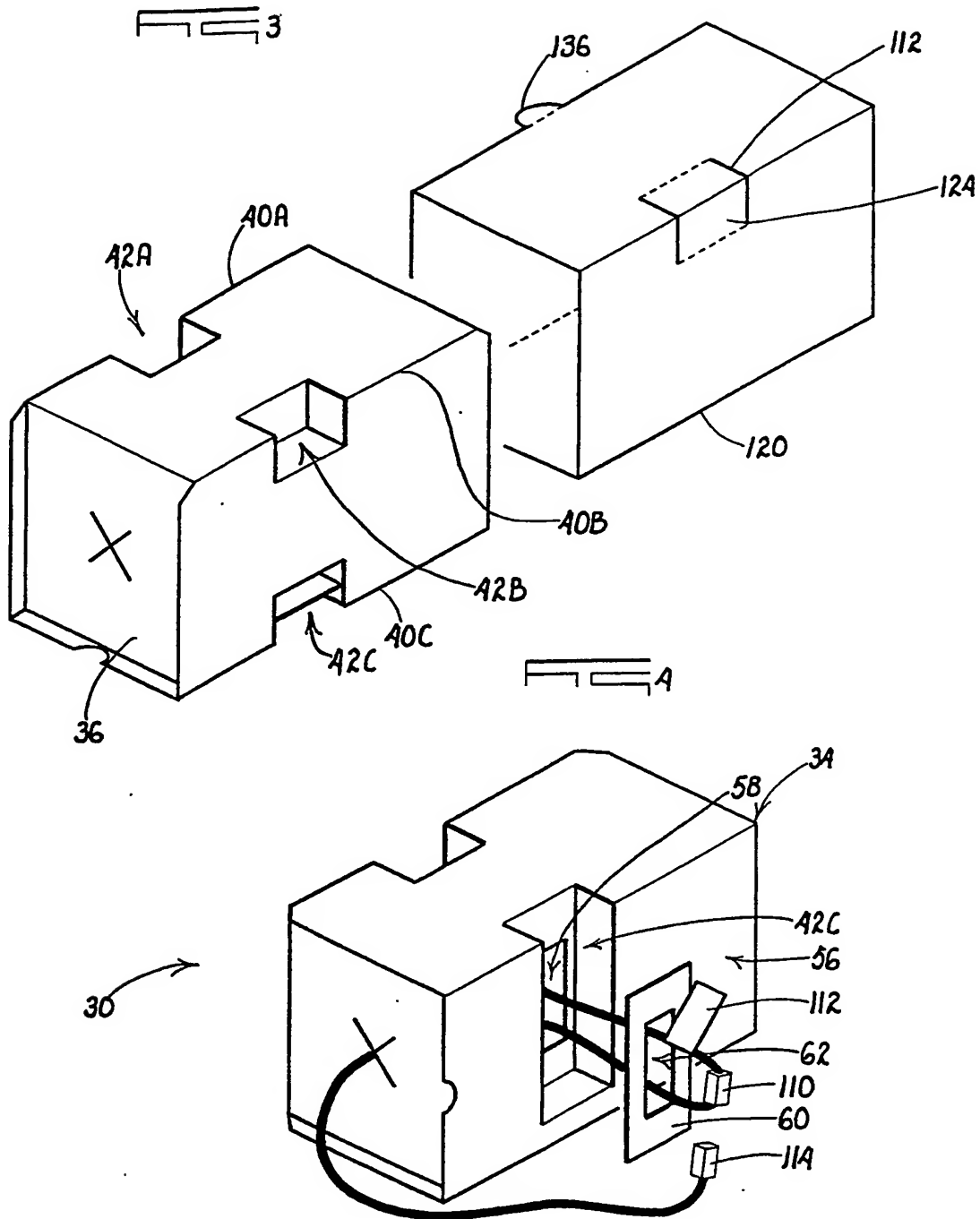


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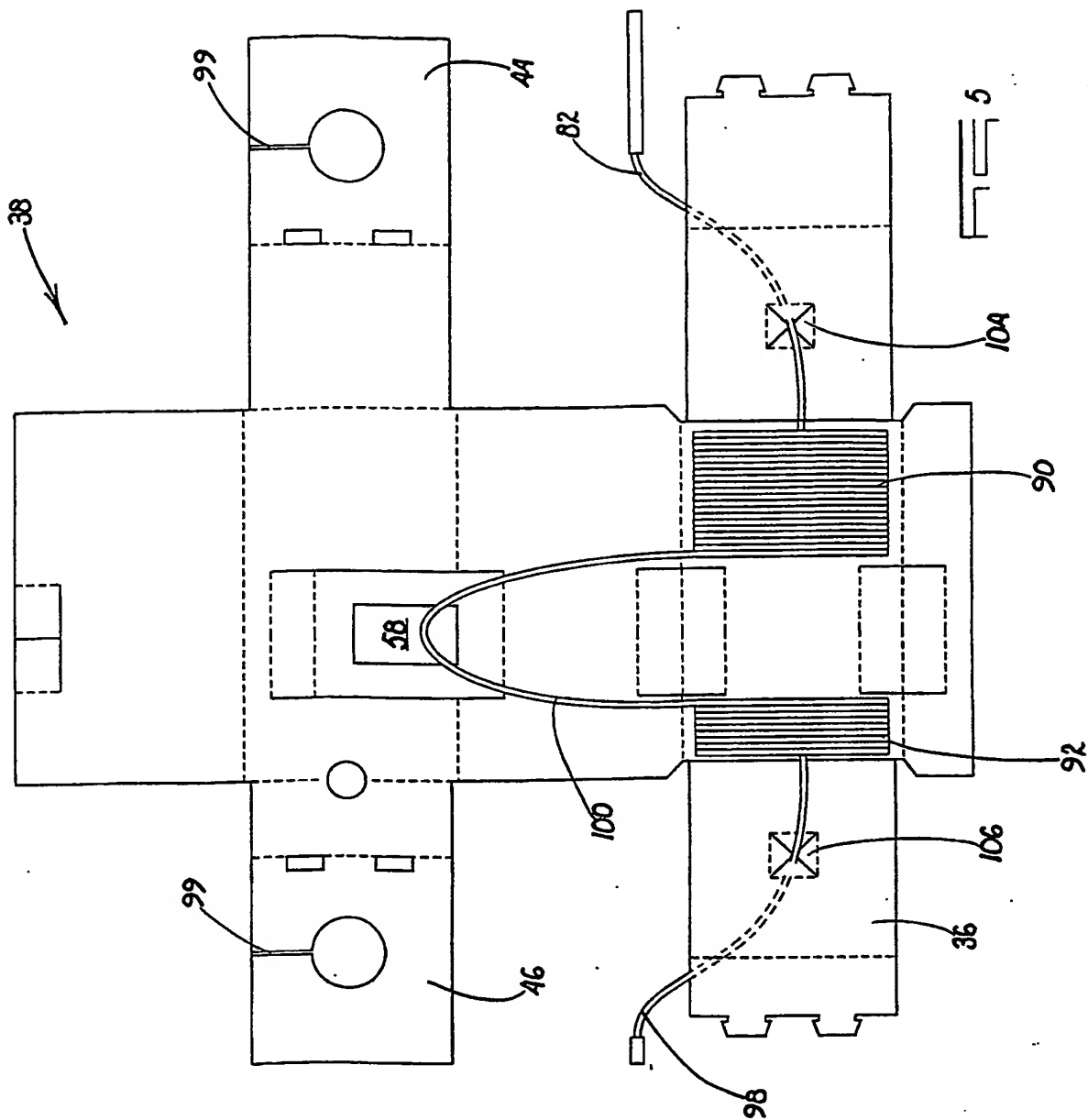


*McCallum, Rademeyer & Freimond*  
**McCALLUM, RADEMEYER & FREIMOND**  
**PATENT AGENTS**  
**FOR THE APPLICANT/s**



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McCALLUM, RADEMEYER & FREIMOND  
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Fig 6

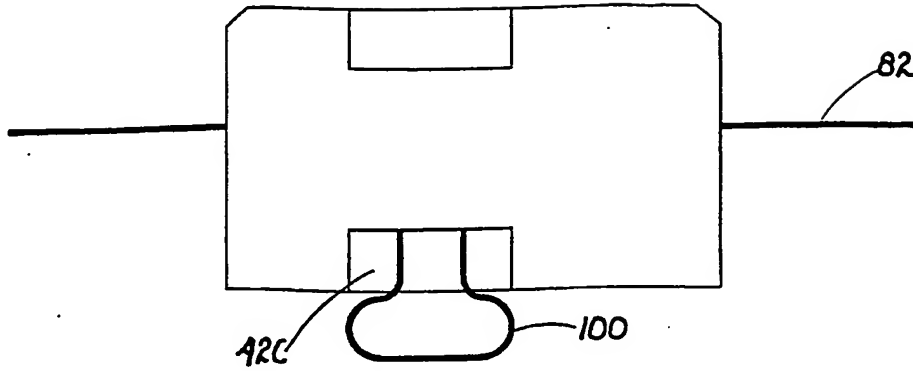


Fig 7

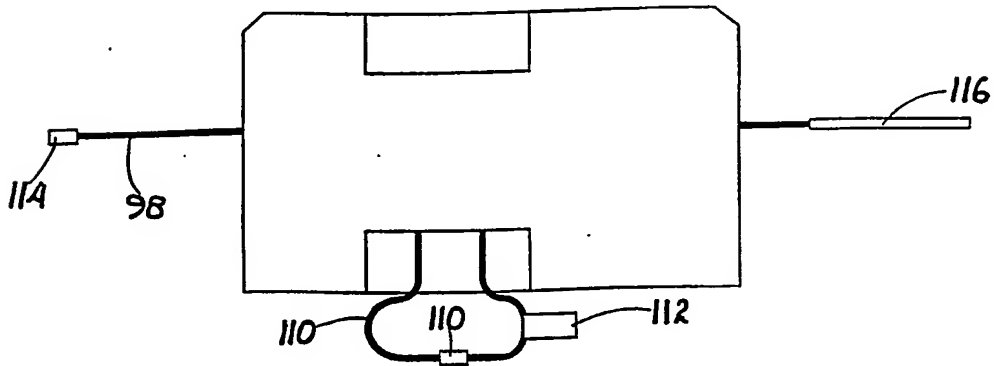
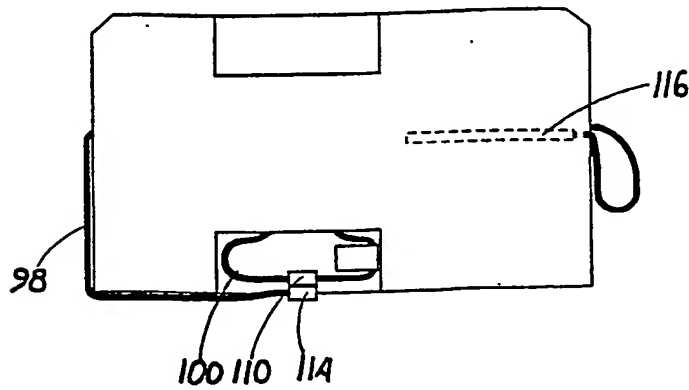
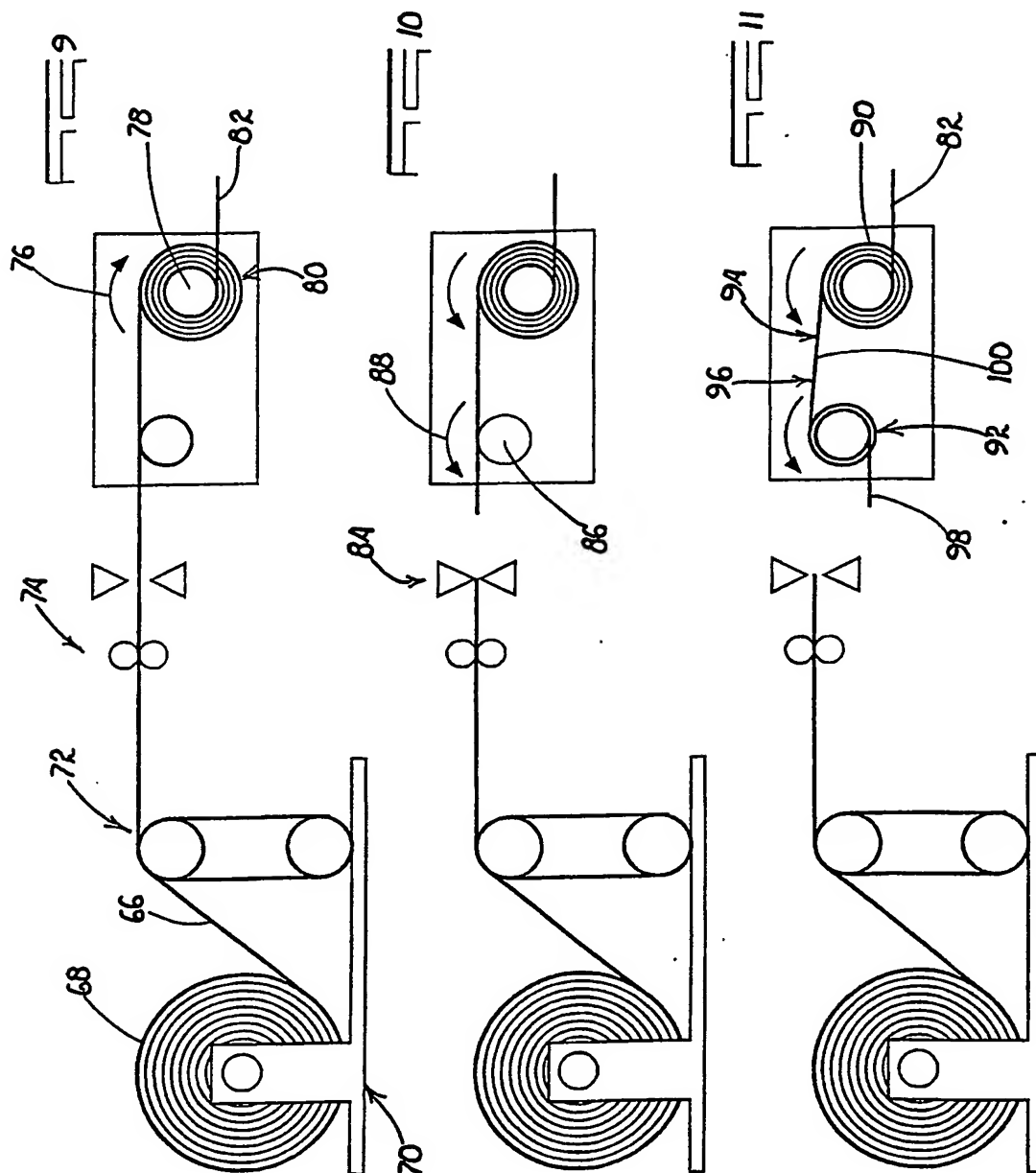


Fig 8



  
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